

Algebra 2 Honors
Logarithmic Functions Test REVIEW EXTRA PRACTICE

Name: _____
Date: _____

1)

- a. Evaluate $\log_6 24$ (3pts)

$$\frac{\log 24}{\log 6}$$

$$\boxed{0.23}$$

- b. Rewrite $\log_6 24$ as a logarithm in base 12. Round to 3 decimal places. (3pts)

$$\log_6 24 = 0.23$$

$$12^{0.23} = 1.7711$$

$$\boxed{\log_6 24 = \log_{12} 1.7711}$$

- c. Evaluate $\log_5 18$ (3pts)

$$\frac{\log 18}{\log 5}$$

$$\boxed{1.7959}$$

- d. Rewrite $\log_5 18$ as a logarithm in base 12. Round to 3 decimal places. (3pts)

$$\log_5 18 = 1.7959$$

$$12^{1.7959} = 86.714$$

$$\boxed{\log_5 18 = \log_{12} 86.714}$$

- e. Evaluate $\log_7 103$ (3pts)

$$\frac{\log 103}{\log 7}$$

$$2.3818$$

- f. Rewrite $\log_7 103$ as a logarithm in base 9. Round to 3 decimal places. (3pts)

$$\boxed{\log_7 103 = \log_9 187.411}$$

$$9^{2.3818}$$

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2) Expand by using the properties of logs to rewrite each expression as a sum or difference: (3pts each)

a) $\log \frac{4x}{2y^3}$

b) $\log_6 x^4 y^5$

c) $\log \frac{8x}{3y^{1/2}}$

$(\log 4 + \log x) - (\log 2 + 3 \log y)$

$4 \log_6 x + 5 \log_6 y$

$(\log 8 + \log x) - (\log 3 + \frac{1}{2} \log y)$

3) Condense the following expressions: (3pts each)

a) $2 \log_5 z + \frac{1}{4} \log_5 r$

b) $\log x + 4 \log y + 2 \log y$

$\log_5 z^2 r^{\frac{1}{4}}$

$\log x y^6$

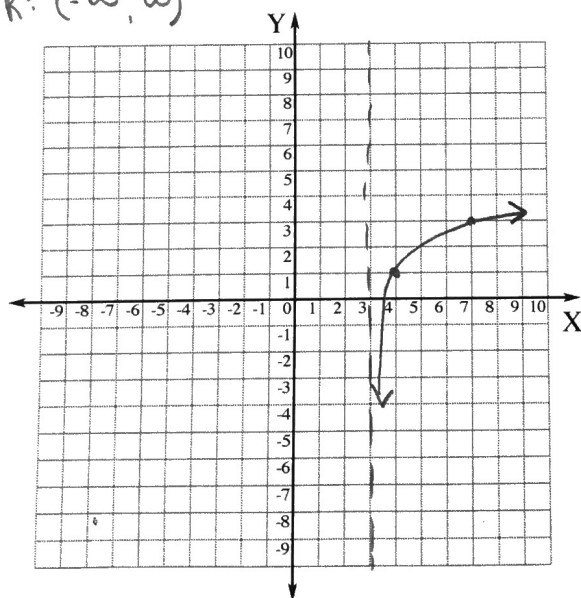
4)

- Graph $y = 2 \log_4(x - 3) + 1$. (4pts)
- Identify the asymptote with the correct equation. (2pts)
- Find the domain & range. (2pts each)

$x = 3$

D: $(3, \infty)$

R: $(-\infty, \infty)$



$y = \log_4 x$

x	y
1	0
4	1
16	2

$y = 2 \log_4(x - 3) + 1$

x	y
4	1
7	3
19	5

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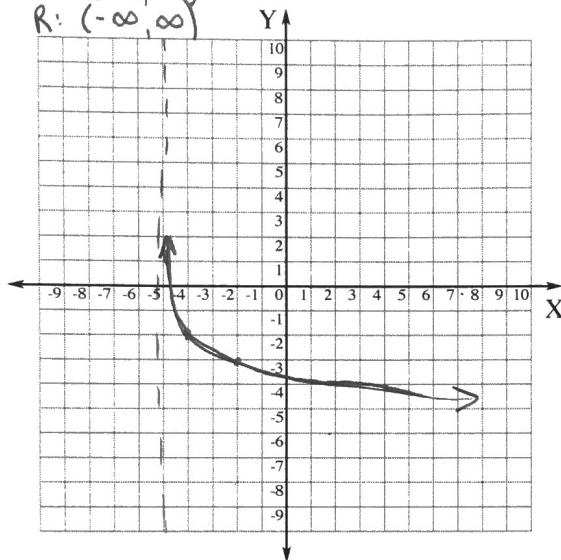
- d. Graph $y = -\log_3(x + 5) - 2$. (4pts)
 e. Identify the asymptote with the correct equation. (2pts)

$$x = -5$$

- f. Find the domain & range. (2pts each)

$$D: (-5, \infty)$$

$$R: (-\infty, \infty)$$



$$\log_3 x$$

x	y
1	0
3	1
9	2

$$-\log_3(x + 5) - 2$$

x	y
-4	-2
-2	-3
4	-4

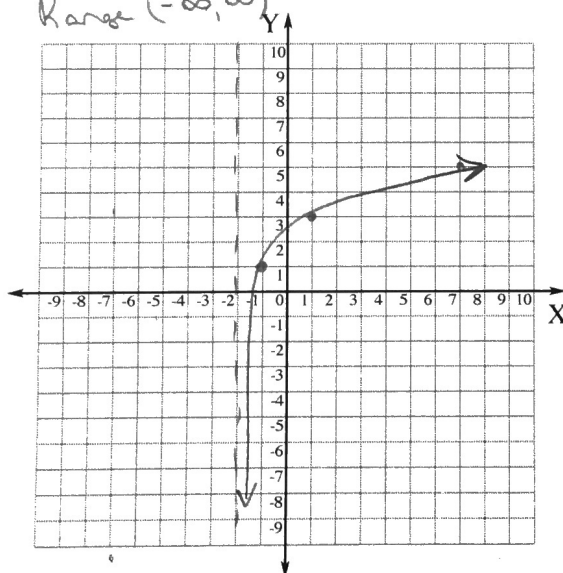
- g. Graph $y = 2 \log_3(x + 2) + 1$. (4pts)
 h. Identify the asymptote with the correct equation. (2pts)

$$x = -2$$

- i. Find the domain & range. (2pts each)

$$\text{Domain } (-2, \infty)$$

$$\text{Range } (-\infty, \infty)$$



$$\log_3 x$$

x	y
1	0
3	1
9	2

$$2 \log_3(x + 2) + 1$$

x	y
-1	1
1	3
7	5

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- 5) You have \$5,000 to invest into an account that earns 5.2% interest annually. How many years will it take to triple your money? (Round to the thousandths of a year.) (4pts)

$$5000(1.052)^x = 15,000$$

$$1.052^x = 3$$

$$x \log 1.052 = \log 3$$

$$x = 21.672 \text{ yrs.}$$

- 6) Solve for x. **Round to the nearest hundredth** if necessary. (4pts each)

a) $\log_5(x+4) = \log_5 7$

$$x+4=7$$

$$x=3$$

b) $5^{2x} - 9 = 147$

$$5^{2x} = 156$$

$$2x \log 5 = \log 156$$

$$x = 1.57$$

c) $4(3^x + 6) = 25$

$$3^x + 6 = 6.25$$

$$3^x = 0.25$$

$$x \log 3 = \log 0.25$$

$$x = -1.26$$

Practice Problems

Solve the following equations:

Remember that the arguments of all logarithms must be greater than 0. Also exponentials in the form of a^x will be greater than 0. Be sure to check all your answers in the original equation.

1. $3^{x-1} = 81$
2. $8^x = 4$
3. $e^x = 5$
4. $-14 + 3e^x = 11$
5. $-6 + \ln 3x = 0$
6. $\log(3x + 1) = 2$
7. $\ln x - \ln 3 = 4$
8. $2 \ln 3x = 4$
9. $5^{x+2} = 4$
10. $\ln(x + 2)^2 = 6$
11. $4^{-3x} = 0.25$
12. $2e^{2x} - 5e^x - 3 = 0$
13. $\log_7 3 + \log_7 x = \log_7 32$
14. $2 \log_6 4x = 0$
15. $\log_2 x + \log_2(x - 3) = 2$
16. $\log_2(x + 5) - \log_2(x - 2) = 3$
17. $4 \ln(2x + 3) = 11$
18. $\log x - \log 6 = 2 \log 4$
19. $2^x = 64$
20. $5^x = 25$
21. $4^{x-3} = \frac{1}{16}$
22. $3^{x-2} = 81$
23. $\log_3 x = 5$
24. $\log_4 x = 3$
25. $\log_2 2x = \log_2 100$
26. $\ln(x + 4) = \ln 7$
27. $\log_3(2x + 1) = 2$
28. $\log_5(x - 10) = 2$
29. $3^x = 500$
30. $8^x = 1000$
31. $\ln x = 7.25$
32. $\ln x = -0.5$
33. $2e^{0.5x} = 45$
34. $100e^{-0.6x} = 20$
35. $12(1 - 4^x) = 18$
36. $25(1 - e^t) = 12$
37. $\log 2x = 1.5$
38. $\log_2 2x = -0.65$
39. $\frac{1}{3} \log_2 x + 5 = 7$
40. $4 \log_5(x + 1) = 4.8$
41. $\log_2 x + \log_2 3 = 3$
42. $2 \log_4 x - \log_4(x - 1) = 1$

Practice Problems Answers

1. 5
2. $\frac{2}{3}$
3. 1.609
4. 2.120
5. 134.476
6. 33
7. 163.794
8. 2.463
9. -1.139
10. 18.086, -22.086
11. $\frac{1}{3}$
12. 1.099
13. $\frac{32}{3}$
14. $\frac{1}{4}$
15. 4
16. 3
17. 6.321
18. 96
19. 6
20. 2
21. 1
22. 6
23. 243
24. 64
25. 50
26. 3
27. 4
28. 35
29. 5.66
30. 3.32
31. 1408.10
32. 0.61
33. 6.23
34. 2.68
35. No Solution
36. -0.65
37. 15.81
38. 0.32
39. 64
40. 5.90
41. $\frac{8}{3}$
42. 2

$$1) 3^{x-1} = 81$$

$$3^4 = 81$$

$$\boxed{x=3}$$

$$2) 8^x = 4$$

$$x \log 8 = \log 4$$

$$\boxed{x = \frac{2}{3}}$$

$$6) \log(3x+1) = 2$$

$$10^2 = 3x+1$$

$$\boxed{x=33}$$

$$9) 5^{x+2} = 4$$

$$(x+2) \log 5 = \log 4$$

$$\boxed{x = -1.139}$$

$$11) 4^{-3x} = 0.25$$

$$-3x \log 4 = \log 0.25$$

$$-3x = -1$$

$$\boxed{x = \frac{1}{3}}$$

$$13) \log_7 3 + \log_7 x = \log_7 32$$

$$\log_7 (3x) = \log_7 32$$

$$3x = 32$$

$$\boxed{x = 10\frac{2}{3}}$$

$$14) 2 \log_6 4x = 0$$

$$\log_6 4x = 0$$

$$6^0 = 4x$$

$$1 = 4x$$

$$\boxed{\frac{1}{4} = x}$$

$$15) \log_2 x + \log_2 (x-3) = 2$$

$$\log_2 (x^2 - 3x) = 2$$

$$2^2 = x^2 - 3x$$

$$4 = x^2 - 3x$$

$$\boxed{x=4}$$

$$16) \log_2 (x+5) - \log_2 (x-2) = 3$$

$$\log_2 \frac{x+5}{x-2} = 3$$

$$2^3 = \frac{x+5}{x-2}$$

$$8 = \frac{x+5}{x-2}$$

$$8x - 16 = x + 5$$

$$\boxed{x=3}$$

$$18) \log x - \log 6 = 2 \log 4$$

$$\log x = 2 \log 4 + \log 6$$

$$\log x = 1.204 + 0.788$$

$$10^{1.9823} = \boxed{96}$$

$$19) 2^x = 64$$

$$\boxed{x=6}$$

$$20) 5^x = 25$$

$$\boxed{x=2}$$

$$21) 4^{x-3} = \frac{1}{16}$$

$$(x-3) \log 4 = \log \frac{1}{16}$$

$$\boxed{x=1}$$

$$22) 3^{x-2} = 81$$

$$3^4 = 81$$

$$\boxed{x=2}$$

$$23) \log_3 x = 5$$

$$3^5 = x$$

$$\boxed{x = 243}$$

$$24) \log_4 x = 3$$

$$4^3 = x$$

$$\boxed{x = 64}$$

$$25) \log_2 2x = \log_2 100$$

$$2x = 100$$

$$\boxed{x = 50}$$

$$27) \log_3 (2x+1) = 2$$

$$3^2 = 2x+1$$

$$\boxed{x = 4}$$

$$28) \log_5 (x-10) = 2$$

$$5^2 = x-10$$

$$\boxed{x = 35}$$

$$29) 3^x = 500$$

$$x \log 3 = \log 500$$

$$\boxed{x = 5.6568}$$

$$30) 8^x = 1000$$

$$x \log 8 = \log 1000$$

$$\boxed{x = 3.3219}$$

$$35) 12(1-4^x) = 18$$

$$1-4^x = 1.5$$

$$-4^x = 0.5$$

$$4^x = -0.5$$

$$\boxed{\text{no solution}}$$

$$37) \log 2x = 1.5$$

$$10^{1.5} = 2x$$

$$\boxed{x = 15.8113}$$

$$38) \log_2 2x = -0.65$$

$$2^{-0.65} = 2x$$

$$\boxed{x = 0.3186}$$

$$39) \frac{1}{3} \log_2 x + 5 = 7$$

$$\left(\frac{1}{3} \log_2 x = 2 \right) 3$$

$$\log_2 x = 6$$

$$2^6 = x$$

$$\boxed{x = 64}$$

$$40) 4 \log_5 (x+1) = 4.8$$

$$\log_5 (x+1) = 1.2$$

$$5^{1.2} = x+1$$

$$\boxed{x = 5.8986}$$

$$41) \log_2 x + \log_2 3 = 3$$

$$\log_2 3x = 3$$

$$2^3 = 3x$$

$$8 = 3x$$

$$\boxed{x = \frac{8}{3}}$$

$$42) 2 \log_4 x - \log_4 (x-1) = 1$$

$$\log_4 \frac{x^2}{x-1} = 1$$

$$\log_4 \frac{x^2}{x-1} = 1$$

$$4 = \frac{x^2}{x-1}$$

$$4x-4 = x^2$$

$$\boxed{x = 2}$$